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PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Production of Heat Resistant Coatings of Metal on Another Metal

I, CHARLES FLETCHER LUMB, of The Homestead, Coombe Hill Road, Kingston Hill, Surrey, a British subject, do hereby declare the nature of this invention to be as follows:—

This invention relates to the production of heat resistant coatings of metal on another metal.

The invention has for its object the obtaining of satisfactory heat resistant surfaces in a practical and efficient manner.

According to the invention a heat resistant surface is formed from nickel, chromium and aluminium, with or without the addition of iron or steel, by spraying the metals in admixture in a finely divided or powder form.

Thus a heat resistant surface composed of nickel, chromium and aluminium, with or without the addition of iron or steel, may be formed by the metals being sprayed, in powder form on to a steel or other base metal surface upon which the protective coating is required with the use of a spraying pistol or gun in which compressed air or gas is employed to induce a flow of the powder through the spray nozzle and through a source of heat which is sufficient to fuse or sinter the sprayed particles and render them firmly adhesive to the base surface.

An iron or steel article coated in the above manner could be heated in a muffle furnace and allowed to cool slowly after which it will be found to resist exceptionally high temperatures. Alternatively the heat to which the coated articles are subsequently exposed in use may be sufficient to produce an alloying of the coating with the base metal.

The required heat resistant surface can be obtained by spraying powders of nickel, chromium and aluminium either in admixture or in a pre-alloyed state and with or without the addition of iron.

Examples of mixtures or alloys which may be suitable for the purpose required are as follows:—

- (a) Ni/Cr alloy powder plus Al powder. 50
- (b) Ni/Cr/Fe alloy powder plus Al powder.
- (c) Ni/Cr/Al alloy powder.
- (d) Ni/Cr/Fe/Al alloy powder.
- (e) Ni/Al alloy powder plus Cr powder. 55
- (f) Cr/Al alloy powder plus Ni powder.
- (g) Fe/Al alloy powder plus powdered Ni and Cr either mixed or alloyed.
- (h) Ni/Al alloy powder plus powdered Fe and Cr either mixed or alloyed. 60
- (i) Cr/Al alloy powder plus powdered Ni and Fe either mixed or alloyed.
- (j) Ni powder plus Cr powder plus Al powder.
- (k) Ni powder plus Cr powder plus Al powder plus Fe powder. 65

In each case the nickel, chromium and aluminium are essentially present but the iron is optional.

The aluminium may be present in amounts of up to 50%.

To encourage the deposited metals to form a protective oxide coating the article to be coated may in some cases be heat treated before use and in order to obtain a good adhesion the article to be coated may have a first application of aluminium sprayed into position before the actual coating is applied. 75

Dated this 5th day of July, 1945.
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COMPLETE SPECIFICATION

Production of Heat Resistant Coatings of Metal on Another Metal

I, CHARLES FLETCHER LUMB, of The Homestead, Coombe Hill Road, Kingston Hill, Surrey, a British subject, do hereby

[Price]

declare the nature of this invention and in what manner the same is to be performed, to be particularly described and

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ascertained in and by the following statement:—

This invention relates to the application of heat resistant coatings of metal on to a base of another metal.

My Patent Specification No. 551,689 describes for example a process of building up a hard surface on another metal surface or base which consists in spraying aluminium and iron or steel with a percentage of iron oxide all in powder form on to the metal support or base with sufficient heat to partially ignite the mixture and result in the same being partially fused and firmly attached to the base either by welding or by intense molecular cohesion, and the mixture could also include chrome, nickel, tungsten, molybdenum or vanadium in powder form.

Further it has been proposed to make a nitrided ferrous article by spraying it with a molten metal or alloy having affinity for nitrogen and then subjecting the article to the action of nitrogen, suitable examples of metals being aluminium, zirconium, titanium, chromium, vanadium, magnesium, beryllium, silicon, nickel, molybdenum, manganese or any desired combinations of them known to the art for alloying with iron to make up a nitridable alloy.

The present invention has for its object the obtaining of satisfactory heat resistant surfaces in a practical and efficient manner.

The invention comprises a method of applying a heat resistant coating of metal on to a base of another metal by spraying in powder form an alloy or mixture consisting of nickel, chromium and aluminium, or one of said metals and an alloy of the other two metals, with or without iron or steel, on to the surface of the base metal by means of a spraying pistol or gun, the powder as it issues from the pistol or gun, being heated to a temperature sufficient to produce fusion or sintering of the particles to render them adherent to the base metal.

An iron or steel article coated in the above manner could be subsequently heated in a muffle furnace and allowed to cool slowly, after which the coated surface will be found resistant to still higher temperatures. Alternatively the heat to which the coated articles are subsequently exposed in use may be relied upon to produce an alloying of the coating with the base metal.

Example of mixtures or alloys which may be suitable for the purpose required are as follows:—

- (a) Ni/Cr alloy powder plus Al powder.
- (b) Ni/Cr/Fe alloy powder plus Al powder.

- (c) Ni/Cr/Al alloy powder.
- (d) Ni/Cr/Fe/Al alloy powder.
- (e) Ni/Al alloy powder plus Cr powder.
- (f) Cr/Al alloy powder plus Ni powder.
- (g) Fe/Al alloy powder plus powdered Ni and Cr either mixed or alloyed.
- (h) Ni/Al alloy powder plus powdered Fe and Cr either mixed or alloyed.
- (i) Cr/Al alloy powder plus powdered Ni and Fe either mixed or alloyed.
- (j) Ni powder plus Cr powder plus Al powder.
- (k) Ni powder plus Cr powder plus Al powder plus Fe powder.

In each case the nickel, chromium and aluminium are essentially present but the iron is optional.

The aluminium may be present in amounts of up to 50%.

To encourage the deposited metals to form a protective oxide coating the article to be coated may in some cases be heat treated, and in order to obtain good adhesion the article may be pre-coated with aluminium sprayed thereon before the coating according to the present invention is applied.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A method of applying a heat resistant coating of metal on to a base of another metal which comprises spraying in powder form an alloy or mixture consisting of nickel, chromium and aluminium or one of said metals and an alloy of the other two metals, with or without iron or steel, on to the surface of the base metal by means of a spraying pistol or gun, the powder as it issues from the pistol or gun, being heated to a temperature sufficient to produce fusion or sintering of the particles to render them adherent to the base metal.

2. A method according to Claim 1, wherein the coated base is subsequently heated to a temperature sufficient to produce alloying of the coating with the base metal.

3. Method according to Claim 1 or 2, wherein the powder consists of any one of the following examples:—

- (a) Ni/Cr alloy powder mixed with Al powder.
- (b) Ni/Cr/Fe alloy powder mixed with Al powder.
- (c) Ni/Cr/Al alloy powder.
- (d) Ni/Cr/Fe/Al alloy powder.
- (e) Ni/Al alloy powder mixed with Cr powder.
- (f) Cr/Al alloy powder mixed with Ni powder.
- (g) Fe/Al alloy powder mixed with

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powdered Ni and Cr either mixed or alloyed.

(h) Ni/Al alloy powder mixed with powdered Fe and Cr either mixed or alloyed.

(i) Cr/Al alloy powder mixed with powdered Ni and Fe either mixed or alloyed.

(j) Ni powder mixed with Cr powder and Al powder.

(k) Ni powder mixed with Cr powder, Al powder and Fe powder.

4. Method according to Claim 3, where-

in the aluminium is present in amounts of up to 50%.

5. Method according to any of the Claims 1 to 4, wherein the base metal is pre-coated by spraying aluminium thereon.

6. A method of applying a heat resistant coating of metal on to a base of another metal by spraying, substantially as described herein.

Dated this 2nd day of July, 1946.

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